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Perspective

Advances in clinical education: a model for infectious disease training for mid-level practitioners in Uganda

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SUMMARY

Advances in health professional education have been slow to materialize in many developing countries over the past half-century, contributing to a widening gap in quality of care compared to developed countries. Recent calls for reform in global health professional education have stressed, among other priorities, the need for approaches that strengthen clinical reasoning skills. While the development of these skills is critical to enhance health systems, little research has been carried out on the effectiveness of applying these strategies in the context of severe human resource shortages and complex disease presentations. Integrated Infectious Disease Capacity Building Evaluation (IDCAP) based at the Infectious Diseases Institute at Makerere University created a training program using current best practices in clinical education to support the development of complex reasoning skills among clinicians in rural Uganda. Over a period of 9 months, the program integrated classroom and clinic-based training approaches and measured indicators of success with particular reference to common infectious diseases. This article describes in detail the IDCAP approach to integrating advances in health professional education theory in the context of an overburdened, inadequately resourced primary health care system; results from the evaluation are expected in 2012.

1. Introduction

Advances in health professional education have been slow to appear in developing countries, contributing to the widening gap in quality of care. Marked by rapidly increasing patient demand and an ongoing shortage of health workers, training in the African context must be efficient, build complex reasoning skills, and maximize existing resources.[1,2] Taking needed clinicians away from busy clinics, even for critical skill upgrades, has a negative impact on patient care. In a summary of studies in six countries including Uganda, 35% of health care providers were absent during their assigned shifts, which was not necessarily attributable to training.[3] With chronic shortages of clinicians, taking limited staff out of the clinic – even for 1 week – results in increased patient burden on clinic staff and/or patients being treated by lower cadres with less training in infectious disease, without oversight from an experienced clinician. In such settings, the cost of all training is high, and the cost of ineffective training is unacceptable.

Recent calls for reform in global health professional education[4,5] have stressed the need for approaches that implement best practices, such as experiential learning, developing inquiry skills, and standardization of learning outcomes. Broad-based training for clinicians, such as the World Health Organization (WHO) Integrated Management of Adult Illness (IMAI) and Integrated Management of Childhood Illness (IMCI), take an important step forward in supporting clinicians in resource-limited settings to achieve standardized learning outcomes through classification and standardized responses to disease conditions. These types of training embrace important concepts in modern health professional education, including integrated rather than disease-specific training and problem-based learning.

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Still, responding effectively to the challenges of infectious disease management in rural, understaffed clinics with limited diagnostic capacity and irregular drug supply requires another skill: the ability to adapt to situational constraints and devise new solutions to complex problems – a process known as adaptive thinking.

While there is evidence to support the IMCI approach,[6–9] far less is known about training approaches that effectively support the development of adaptive reasoning skills. Integrated Infectious Diseases Capacity Building Evaluation (IDCAP) included a training program that reflects our latest understanding of how clinicians build adaptive reasoning skills, and measured the impact at rural clinics in Uganda.

2. Progressive strategies for clinical teachers

The process that expert clinicians use to make decisions has been discussed in the health professional education literature – particularly, the use of adaptive thinking (analytic, conscious) versus routine thinking (non-analytic, automatic) to solve clinical problems. The difference has been characterized this way: "whereas routine experts are able to solve familiar types of problems quickly and accurately, they have only moderate capabilities in dealing with novel types of problems. Adaptive experts, on the other hand, may be able to invent new procedures derived from their expert knowledge."[10] Routine thinking is not inferior to adaptive thinking; rather, expert clinicians use both types, each in the appropriate context.[11] Progressive strategies for clinical teachers, therefore, include comprehensive approaches that enable students to practice thinking about medicine in both routine and adaptive ways.

IDCAP focused on three key practices for building routine and adaptive reasoning skills: (1) articulating the reasoning process; (2) practice-embedded learning; (3) collective learning in the clinic.

There is growing evidence that articulating the reasoning process helps learners understand how to think through clinical problems.[12,13] Learners generally internalize knowledge in alignment with the structure of the curriculum. Successful approaches to teaching complex clinical reasoning emphasize the process of diagnosis: presenting complaints, investigations (history, physical and laboratory examinations), problem presentation, generation of a hypothesis, selection of an illness script and finally, a diagnosis. The focus for clinical teachers is on reinforcing the diagnostic process, allowing trainees to articulate problem presentations and to compare/contrast possible diagnoses. In short, clinical teachers who articulate the reasoning process and ask trainees to do the same are more effective at developing reasoning skills.

Practice-embedded learning means encouraging clinicians to think of their daily practice as the best opportunity for growth.[14,15] Practice-embedded learning may involve a mentor working alongside a less experienced clinician and/or conducting independent exercises, such as reflecting on challenging cases through journaling and research.

If we want to see improvement in patient care, the system is as important as the clinician him/herself. Collective learning means creating opportunities for clinic teams to discuss the rationale for decisions.[16] Additionally, some research shows that peer discussion enhances problem-solving.[17] Collective learning and effective teamwork are key to improving the clinic system and quality of patient outcomes.[18,19]

3. Implementing key learning strategies in Uganda

Thirty-six health center IV (HCIV) facilities (county level health centers) across Uganda were selected to participate in the evaluation, as clinicians at this level initiate antiretroviral therapy (ART), treat tuberculosis (TB), and are likely to have the higher patient volume needed to assess changes in care after training.[20]

Each site nominated two individuals to be trained: two clinical officers (CO), or if two were not available, one CO and one nursing officer (NO) (sometimes referred to as registered nurses). See Figure 1 for full inclusion criteria for health centers and trainees. COs and NOs were selected over higher-ranking medical officers (MO) for two main reasons. First, the shortage of MOs, particularly in rural areas, means that COs and NOs regularly manage patients with complex infectious diseases. They have the right experience on which to build adaptive reasoning skills and can immediately apply new practices in their work. A 2006 survey of 44 health facilities in Uganda that were accredited to provide ART showed that 64% of the professionals who prescribed ART were COs, nurses, or midwives, rather than doctors.[21] COs and NOs were selected over lower cadre health professionals to comply with Ministry of Health directives on scope of practice.

Second, given their shorter pre-service training period, COs/NOs are more likely to need ongoing training and support. Among professionals in the 2006 survey who prescribed ART, COs/NOs were significantly less likely to have training in how to monitor patients on ART and were significantly more likely to self-report their overall knowledge of ART as lower than good.

Time is the biggest challenge to teaching complex reasoning in resource-limited settings. With nearly 50% vacancy in established positions for health workers in Uganda,[20] off-site training can exacerbate shortages, resulting in additional burden for health workers and longer queues for patients. To deliver a sustained intervention while minimizing out-of-clinic time, IDCAP combined classroom training, distance learning, and on-site support, spanning a period of 9 months (see Figure 2).

3.1. Modality one: classroom training

The training program began with the 3-week core course, Integrated Management of Infectious Diseases (IMID), featuring detailed case studies, discussion, and small group work as the primary means of instruction. Instead of using a case as a compliment to a session, the session is built from the case indicated in the title of the session (see Figure 3). With the patient entering the clinic room and describing symptoms as the starting point, trainees discuss the steps to conduct a history, physical examination, and recommend laboratory tests to determine possible diagnoses for the patient. Relevant medical concepts are addressed as they apply to the case – for example, when a list of differential diagnoses is determined, the group discusses the *typical* presentation for each and makes comparisons to the case at hand.

A set of clinical decision-making guides (CDGs) formed the backbone for many of the sessions, leading trainees through a set of formal decision points as they discussed a case study. Over the 3 weeks, trainees applied the steps in clinical decision-making over 40 times to cases that increased in complexity.

Twelve weeks later, trainees returned to the classroom for a 1-week booster course. The CDGs were revisited to review and reinforce decision-making processes, while analyzing actual cases. Trainees presented challenging cases from their own practice, focusing on areas where they most needed to learn and grow (see Figure 4). Rewards were given to trainees who provided the best teaching cases. After another 12 weeks at their facility, trainees returned to the classroom for the second 1-week booster course, which resembled the first.

Both the core and booster courses included clinical rotations, allowing trainees to apply concepts learned under the guidance of experienced clinicians. In total, the 5 weeks of classroom training

Health Center Inclusion Criteria

1. HCIV or comparable facility such as a small general hospital or private, not-for-profit health center
2. Active site for rolling out ART
3. No current participation in malaria, TB and HIV/AIDS services quality improvement projects
4. Population of potential patients who are not prisoners
5. Representation from all regions of Uganda (East, North, Central and Southwest)
6. Functional laboratory that can conduct at least six investigations including: HIV rapid test, malaria blood smear, TB sputum smear, urinalysis, stool analysis, and hemoglobin estimation

CO/NO Inclusion Criteria

1. Clinical officer or registered nurse
2. Involved in daily management of patients in the outpatients clinics
3. Spend over 80% of their time at the health facility seeing patients
4. Available to participate in the program for 21 months
5. Preference for CO/NO who:
    a. Held leadership roles such as being in charge of ward/clinic or focal person for malaria, TB, HIV or PMTCT
    b. Previous training and experience in counseling, IMCI or IMAI

Figure 1. Facility and participant inclusion criteria (ART, antiretroviral therapy; CO, clinical officer; HCIV, health center IV; IMAI, Integrated Management of Adult Illness; IMCI, Integrated Management of Childhood Illness; NO, nursing officer; PMTCT, preventing mother to child transmission; TB, tuberculosis).

included 12 half-day clinical rotations in a variety of health care settings (pediatric clinics, TB wards, maternity, general admission) and exposure to a group of 20 physicians with expertise in infectious disease. Upon returning from clinical rotations, cases were presented to the larger group.

3.2. Modality two: distance learning

During each of the 12-week out-of-classroom periods, trainees used a clinical practice logbook, designed to support three practices that enable a lifetime of learning: recognizing interesting and complex cases from day-to-day practice; identifying resources for consultation; articulating case details for another clinician and agreeing on an action plan.

Each week, trainees wrote-up one case, detailing the patients' presenting complaints, results from investigations (history, physical and laboratory examinations), problem list, differential diagnoses, and a description of the clinical reasoning that led to the final diagnosis. By the end of the 9 months, trainees had completed a minimum of 30 case write-ups.

As part of the distance learning process, trainees were asked to record problems they encountered, along with sources consulted for additional information, such as training materials and/or national guidelines. Trainees were encouraged to contact the AIDS Treatment Information Center (ATIC), a call-in service staffed by doctors and pharmacists, for guidance and advice. During the booster courses, trainees reported on the quality of their consultations.

During on-site support visits, logbook entries were used to identify trainee challenges and guide mentoring. Through the use of these logbooks, trainees practiced identifying challenging cases and developing strategies for effective consultation.

3.3. Modality three: on-site support (OSS)

While completing the distance learning modules, trainees were visited each month by a four-member mobile team, consisting of

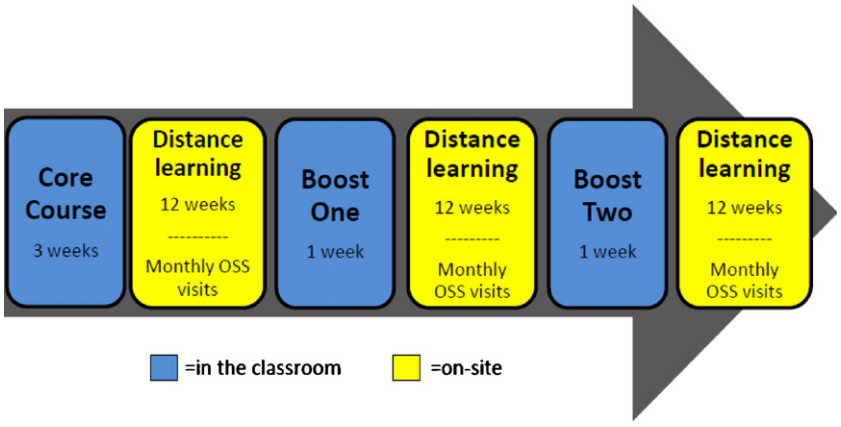

Figure 2. Diagram of IDCAP 9-month training program.

Module A: Introduction to IDCAP IDT
- S1: Introduction
- S2: Clinical Management in Infectious Diseases
- S3: Emergency Care in Infectious Diseases
- S4: Introduction to Quality Improvement

Module B: Adult Outpatient Clinic
- S5: A Patient w/ Fever: Malaria
- S6: A Patient w/ Fever: Negative Malaria Smear
- S7: A Patient w/ Cough: Respiratory Illness, TB
- S8: A Patient w/ Mouth or Throat Problem
- S9: A Patient w/ Skin Problem
- S10: A Patient w/ Headache: Central Nervous System (CNS) Infection
- S11: A Patient w/ Diarrhea

Module C: Routine Care of the HIV patient
- S12: A Patient for HIV Testing
- S13: A Newly Diagnosed HIV Patient
- S14: An HIV-infected Patient who needs ART
- S15: A Patient on ART for Follow-Up

Module D: Antenatal Clinic
- S16: A Pregnant Woman in Antenatal Clinic
- S17: A Pregnant Woman diagnosed w/ HIV
- S18: CQI: Designing an Improvement Project

Module E: Pediatric ID: unique issues in HIV
- S19: An HIV-exposed Infant
- S20: A Child w/ Symptomatic HIV Infection
- S21: An Adolescent w/ HIV

Module F: Pediatric ID: focused cases
- S22: A Child w/ Cough
- S23: Designing an Improvement Project
- S24: A Child w/ Fever: Meningitis
- S25: A Sick Neonate: Management of Fever
- S26: A Child w/ Diarrhea
- S27: A Patient w/ Malnutrition

Module G: HIV prevention
- S28: Overview of HIV Prevention
- S29: A Patient at Risk: STIs and HIV prevention
- S30: A Health Worker w/ Needle stick Injury: PEP
- S31: A Discordant Couple and HIV prevention

Module H: Complex problems in ID
- S32: A Patient w/ HIV, Cough: HIV/TB co-infection
- S33: A Patient w/ History of Treated TB and Cough
- S34: Designing a Quality Improvement Project
- S35: A Patient w/ Chronic Cough: HIV, Respiratory Illness
- S36: A Patient w/ Persistent Fever
- S37: A Patient on ART Who Gets Sicker
- S38: A Patient w/ Complicated Malaria
- S39: Orientation to Distance Learning

Figure 3. Overview of IDCAP curriculum sessions (ART, antiretroviral therapy; CQI, continuous quality improvement; ID, infectious disease; IDT, infectious disease training; PEP, post-exposure prophylaxis; STI, sexually transmitted infection; TB, tuberculosis).

Day One: each trainee was asked to write down the most challenging case they had encountered in the last three months.

Day Two: the facilitator handed out one-paragraph summaries of the challenging cases for all participants. Trainees were asked to vote on which ones they thought were the most difficult. Results were tallied, and trainees were asked to present the top five cases the next day.

Day Three: Top five cases were presented for discussion in class.

Discussion is peer-led, focused on the best teaching cases, and encourages a problem-solving environment in the classroom.

Figure 4. Core course activity: peer-identification of challenging cases.

an MO, CO, NO, and laboratory technologist. Day 1 of the 2-day visit included group learning sessions and individual mentoring for the clinical and laboratory staff, encouraging members of the multidisciplinary team to learn together and examine systems issues that interfere with patient care. Day 2 was devoted to continuous quality improvement activities.

The monthly learning sessions had two components: a 1-hour general session to discuss cross-cutting issues in the clinic and cadre-specific breakout sessions. The combination of general and break-out sessions among clinicians, laboratory professionals, and records clerks improved the quality of malaria case management in a similar setting.[22] Each IDCAP learning session focused on a monthly theme (see Figure 5).

In this way, each modality created opportunities for trainees to apply concepts in a supported way. Further, trainees achieve a deeper understanding when training includes varied examples, ample time for comparison, and exposure to a variety of experts.[10,23,24] Over the 9 months, IDCAP trainees applied complex clinical reasoning concepts by: (1) analyzing 40–50 structured cases; (2) discussing 20–30 presentations from their peers; (3) writing-up 30–40 of their own cases; (4) spending 36 h in clinical placements, discussing cases with physicians with expertise in infectious disease; (5) discussing cases with 20 physicians with clinical expertise (in the classroom, during clinical placements, and during on-site support visits).

The program was evaluated using a mixed design. First, the IMID training program was evaluated using a pre/post design. Secondly, on-site support was evaluated using a cluster randomized trial with 18 sites randomly assigned to each study arm: in arm A trainees received IMID, distance learning, and on-site support in 2010; in arm B trainees received IMID and distance learning and served as a control for on-site support in 2010. Arm B received on-site support in 2011.

Three types of outcomes were measured, as outlined below.

3.4. Individual competence and practice of IMID trainees

Individual competence was measured with 12 case scenarios, also referred to as vignettes. Individual practice was measured through clinical observation by an experienced clinician using standardized checklists. Each trainee was observed during five visits with an outpatient aged less than 5 years and with five patients at an HIV clinic, before and after IMID and on-site support, for a total of 20 observations.

3.4.1. Facility performance

Performance on 24 facility-based indicators was measured monthly using a data surveillance system that included a modified outpatient record and Ministry of Health registers for TB, HIV, maternal and child health, and inpatients.

Visit 1: Emergency care in adults and children

General session: early, effective triaging and assessment based on the ABCCD approach

- Clinical mgmt in emergency care (CO/NO)
- Priority signs in emergency care (EN, midwives)
- The lab in emergency care (lab)

Visit 2: Fever and malaria case management

General session: diagnosis and treatment of simple malaria

- Clinical management of severe malaria (CO/NO)
- Malaria in pregnancy (EN, midwives)
- Laboratory testing in malaria (lab)

Visit 3: Comprehensive HIV care

General session: initial clinical evaluation of HIV-pos patient

- Clinical, immunologic staging, start ART (CO/NO)
- Preparation, assessment of adherence (EN, midwives, counselors)
- Laboratory testing in HIV: HIV AB testing (lab)

Visit 4: Prevention of mother-to child transmission

General session: principles of PMTCT management

- ART in pregnancy, HIV-exposed infant (CO/NO)
- Routine testing, infant feeding (EN, midwives)
- Lab testing in the HIV-exposed child (lab)

Visit 5: Pediatric ART

General session: identifying, testing HIV-exposed infants

- Starting children on ART (CO/NO)
- Caring for HIV-exposed infant (EN, midwives)
- Testing for intestinal parasites (lab)

Visit 6: ART follow-up and monitoring

General session: assessing adherence, adverse effects

- Patients starting ART who get sicker (CO/NO)
- Assessing adherence (EN, midwives, counselors)
- Principles of Good Laboratory Practice (lab)

Visit 7: Diagnosis, mgmt of respiratory infections

General session: TB suspects, infection control

- Diagnosis of smear-negative TB (CO/NO)
- TB screening (nurses, midwives, others)
- Laboratory testing: sputum AFB smear (lab)

Visit 8: Tuberculosis case management

General session: case-definitions, adherence, DOTS

- Initiation, monitoring TB therapy (CO/NO)
- Contact-tracing in TB (EN, midwives)
- Customer care in the lab (lab)

Figure 5. Topics for on-site support visits—general sessions and breakout sessions (AB, antibody; AFB, acid-fast bacillus; ART, antiretroviral therapy; CO, clinical officer; DOTS, directly observed therapy, short-course; EN, enrolled nurse; lab, laboratory; NO, nursing officer; PMTCT, preventing mother to child transmission; TB, tuberculosis).

3.4.2. Population outcomes

A population-based survey of households within 5 km of the sites will compare mortality of children under 5 years of age. The Uganda Bureau of Statistics conducted a listing of about 90 000 households and a survey among more than 25 000 households in 600 enumeration areas.

IDCAP was designed to fill a known gap in the evidence regarding the combination of training modalities.[25] Combining classroom training, distance learning, and on-site support, IDCAP delivered a comprehensive, longer-term program, while minimizing disruptions to patient care. Based on this innovative combination of best practices, we expect IDCAP to make an important contribution to strengthening health systems in Africa. Evaluation results are expected in 2012.

4. Conclusions

More effective training strategies are needed for the African context. Most training falls short of current best practices in health professional education, citing human resource shortages as justification for short courses, which achieve largely knowledge-based goals and neglect the practical application of concepts learned. While some existing programs successfully build routine reasoning skills across key areas of practice, training that supports the development of adaptive reasoning is also needed.

By providing longer-term support to translate clinical experiences into learning, IDCAP models an approach for building complex reasoning skills in understaffed rural clinic settings. This approach minimizes trainee time away from the clinic by carefully combining classroom training, distance learning, and on-site support – linked from inception and designed around clear learning objectives – ensuring that each modality supports and reinforces the other. The training uses progressive learning strategies, ensuring opportunities for articulating the reasoning process, practice-embedded learning, and group-focused sessions.

More information about the IDCAP and IMID can be found at http://www.accordiafoundation.org.

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